

# **EMPLOYEE REGISTRATION MANUAL**



**Gary W. Black  
Commissioner**

Revised July 2006  
Georgia Department of Agriculture  
Georgia Structural Pest Control Commission

## **TABLE OF CONTENTS**

Chapter 1: INTRODUCTION

Chapter 2: LAW AND RULES

Chapter 3: PEST BIOLOGY AND IDENTIFICATION

Chapter 4: PESTICIDES

Chapter 5: HOW TO READ A LABEL AND A MSDS

Chapter 6: EQUIPMENT USED IN THE INDUSTRY

Chapter 7: APPLICATION TECHNIQUES

Chapter 8: PROTECTION OF THE ENVIRONMENT

Chapter 9: SAFETY

## CHAPTER 1 INTRODUCTION

The public demands professionalism from everyone that provides a service. The professional pest management industry is no exception. Some of the services we provide include:

- inspection of pest infestations
- recommendation for control procedures
- application of pesticides and other control procedures
- modification of structures to reduce chances of pest infestations

To continue to provide these professional services we must keep up with the changes in technology. We must also show the public that we have the training and skills needed to perform these services.

The Georgia Structural Pest Control Commission, with the support of the professional pest management industry, has developed a program to meet these goals. This is the employee registration program.

This program requires that all employees who make inspections, propose treatments, or apply control procedures, meet the following requirements:

- Attend a minimum of ten hours of classroom training
- Complete 70 hours of supervised "on the job" training
- Take and pass a written exam

Once the exam is passed and the employee becomes registered attendance at ongoing Commission approved training is required to keep the registration. This allows the employee to keep up with changes in the industry. There are specific training requirements for each registered category.

This manual will help the employee prepare for the registration exam. It also will serve as a reference source for future use.

The pest control industry is an essential part of today's society. It helps protect man and his possessions. You can be proud to be part of it!

## CHAPTER 2 LAW AND RULES

Pesticides are very important tools as they help protect man's food and possessions. They also protect man and animals by controlling pests that can carry and transmit disease.

Most pesticides can be dangerous if not used properly. Congress has passed laws that control pesticide use. The states have also passed a number of similar laws to control pesticide use. These laws balance the need for pesticides and the need to protect man and the environment. There are several laws that govern the professional pest management industry in Georgia.

### Federal Statutes and Regulations

#### Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA)

Congress passed the first Federal Insecticide, Fungicide and Rodenticide Act (FIFRA) in 1947. This law was created to regulate the registration and labeling of the pesticides that were being moved from one state to another. In 1972 FIFRA was changed to cover things such as labeling, registration, and classification of pesticides. It also created requirements for:

- certification of operators
- safety
- pesticide disposal
- protection of the environment

FIFRA is administered by the Environmental Protection Agency (EPA).

#### Labeling and Use of Pesticides

THE LABEL IS THE LAW! Most applicators have heard this phrase many times. It is true because the label is the legal document which controls the use of the pesticide. However, it is important to point out that any other printed or electronically available information from the manufacturer, such as guidance documents or technical bulletins also governs the use of the pesticide. These other documents are referred to as labeling. Labeling carries the same enforcement weight as the actual label on the pesticide container.

#### Classification and Registration of Pesticides

The Environmental Protection Agency (EPA) and the Georgia Department of Agriculture register all pesticides used in Georgia. Manufacturers of pesticides must provide detailed information about the pesticide to EPA including:

- toxicity of the pesticide

- hazard to the applicator
- effect on the environment

Based on this information EPA decides how each pesticide is classified. It is classified either for general use or restricted use. Pesticides that cause very little or no damage to the environment when used properly are classified for general use. Pesticides that may cause damage to the environment or cause human injury even when used properly are classified as restricted use.

Only a certified applicator or someone operating under his or her supervision may apply a restricted use pesticide.

### Certification of Operators

Certification is the way that an operator proves that he or she know the safe way to carry out pesticide application.

If you violate FIFRA you are subject to civil penalties up to \$5,000. Violations of the law may also subject you to criminal penalties up to \$25,000 and/or 1 year in prison. Before EPA can fine you, you have the right to ask for a hearing in your own city or county.

### Occupational Safety and Health Act

The Occupational Safety and Health Administration (OSHA) in the Department of Labor administers the Occupational Safety and Health Act of 1970. It requires anyone with 11 or more workers to keep certain records and make reports. The records must include all work related deaths, injuries, and illnesses. A report is not required for minor injuries needing only first aid treatment. If the injury involves a medical treatment, loss of consciousness, restriction of work or motion, or transfer to another job, a report must be made.

### Endangered Species Act

The Endangered Species Act of 1973 provides legal protection for endangered and threatened species. It also requires all federal agencies (such as EPA) to be sure that their actions do not threaten the existence of any endangered species. If the U.S. Fish and Wildlife Service determines that the use of a pesticide may threaten an endangered species, EPA can restrict the use of that pesticide. When the endangered species would be likely to contact the pesticide, restricted use areas can be designated.

The killing of an endangered species can result in a maximum fine of \$20,000 and/or one year in prison.

### Georgia Regulations

#### Georgia Structural Pest Control Act

The Georgia Department of Agriculture and the Georgia Structural Pest Control Commission administer the Structural Pest Control Act. The Department of Agriculture is also the enforcement agency for the Act. The Act is the primary law for the pest control industry in this state. The requirements for this Act include:

Company License - All pest control companies must be licensed before they begin operation.

Certified Operator - Every pest management company must have one person who has taken and passed a certification examination. This is a different and more extensive examination than the Employee Registration Examination. The categories of certification are; household pest control (HPC), control of wood destroying organisms (WDO), and fumigation (FUM). A company may only operate in the categories in which it currently employs a certified operator.

Registered Employees - All non-certified applicators and salespersons must take and pass an examination before they can operate without direct supervision of a certified operator or a previously registered employee.

Recertification - All certified operators and registered employees must be recertified periodically. Registered employees must accumulate training as follows:

- Household Pest Control - 8 hours 3 hours of which shall address proper Integrated Pest Management (IPM)
- Wood Destroying Organisms - 8 hours 3 hours of which shall address proper preconstruction treatments
- Fumigation - 3 hours

Computer based training shall be limited to no more than 4 hours for Household Pest Control of which only 1 hour may address proper Integrated Pest Management (IPM), 4 hours for Wood Destroying Organisms of which only 1 hour may address proper preconstruction treatments and 1 hour for Fumigation

All credit must be earned before May 1 of each odd numbered year. All registrations, certifications, and licenses expire on June 30th of each odd numbered year.

Contracts for the Control of Wood Destroying Organisms – Copies of all contracts and supporting documentation must be kept for two years following the expiration of the contract. A contract must be issued for every treatment before the work begins. The contract must include:

- the specific type of treatment to be performed
- the effective date and contract period
- diagram of the structure(s) showing the area of any active or previous infestation
- price of treatment
- terms of any guaranty or warranty including a disclosure statement as to the type of guarantee

- if the work is bonded
- the conditions for renewal including reinspection interval
- provisions for a limitation of liability
- what happens if the structure is changed
- the three day right to cancel the contract
- for baiting systems, a notice about removal of the system

Reinspection Recordkeeping Requirements - Reports of all monitoring, inspections or reinspections of structures, baiting systems or devices under contract must be maintained for two years. The reports must include:

- date of monitoring, inspection or reinspection
- name of person performing the monitoring, inspection or reinspection
- whether or not wood destroying organisms or signs of termite infestation were found

Wood Infestation Inspection Report - All wood infestation inspection reports or clearance letters must be issued on a state approved form. The report is a statement of what is found when the structure was inspected. It covers previous and active infestations of:

- subterranean termites
- powder post beetles
- wood boring beetles
- dry wood termites
- wood decaying fungus

#### Regulations for Minimum Treatment

Treatment of Subterranean Termites - Minimum adequate subterranean termite control measures shall include:

- Post Construction Soil Termiticide Application (Comprehensive)
- removal of all cellulosic material from under the building
  - removal of all wood to earth contacts except pressure treated wood designed for ground contact
  - removal of all accessible termite tunnels
  - application of an approved termiticide to create a continuous barrier to all exposed soils and masonry voids consistent with the products label and labeling directions
  - adequate ventilation

- Post Construction Soil Termiticide Application (Defined)
- removal of all cellulosic material from under the building
  - removal of all wood to earth contacts except pressure treated wood designed for ground contact
  - removal of all accessible termite tunnels

- application of an approved termiticide to create a continuous barrier to all exposed soils and slabs adjacent to the structure consistent with the products label and labeling directions
- adequate ventilation

#### Post Construction Non Soil Termiticide Applications, Other Than Baits

- removal of all cellulosic material from under the building
- removal of all wood to earth contacts except pressure treated wood designed for ground contact
- removal of all accessible termite tunnels
- application of an approved termiticide consistent with the products label and labeling directions
- adequate ventilation

#### Post Construction Baits or Baiting Systems

- removal of all cellulosic material from under the building
- removal of all wood to earth contacts except pressure treated wood designed for ground contact
- removal of all accessible termite tunnels unless specified on the product label
- application of an approved bait or baiting system consistent with the products label and labeling directions, including monitoring of the bait or baiting system
- adequate ventilation

#### Preconstruction Soil Termiticide Application

- removal of all cellulosic material from under the building
- removal of all wood to earth contacts except pressure treated wood designed for ground contact
- application of an approved termiticide to create a continuous barrier to all exposed soils and masonry voids consistent with the products label and labeling directions
- adequate ventilation

#### Preconstruction Non Soil Termiticide Application

- removal of all cellulosic material from under the building
- removal of all wood to earth contacts except pressure treated wood designed for ground contact
- removal of all accessible termite tunnels unless specified on the product label
- application of an approved termiticide consistent with the products label or labeling directions with an appropriate dye marker where required and permitted
- adequate ventilation

Treatment of Powder Post Beetles and Wood Borers - Treatment of powder post beetles and wood borers shall include application of an approved pesticide consistent with the products label and labeling directions and application of a vapor barrier and



installation of adequate ventilation.

Treatment of Wood Decay Fungi - Treatment of wood decaying fungi shall include application of a vapor barrier and installation of adequate ventilation.

Treatment of Dry Wood Termites - Treatment of dry wood termites shall include application of an approved pesticide consistent with the products label and labeling directions.

Inspection - The enforcement agency may inspect treated structures and require the correction of any deviations from the treatment standards.

Household Pest Control - Only pesticides registered with the EPA and the Georgia Department of Agriculture are permitted for use. All pesticides must be applied consistent with the products label or labeling directions.

Household Pest Control Contracts - A contract must be issued for all treatments before the work begins. All contracts must contain the three day right to cancel the contract.

Treatment of Schools - The treatment of schools involves taking special precautions that minimize the potential exposure of students to pesticides. Schools include any school, public or private, college, university, or child daycare center. Precautions include:

- Applications of pesticides to a room only if students are not expected to be present in the room for a minimum of three hours or longer if directed by the pesticide products label or labeling
- Applications of baits, rodenticide baits in tamper-resistant containers or bait stations, as well as botanical insecticides, insect growth regulators and insecticidal soaps at anytime as long as students are not present in the room
- Applications of baits, rodenticide baits in tamper-resistant containers or bait stations, as well as botanical insecticides, insect growth regulators and insecticidal soaps at anytime to any open area or multi-purpose area if the area within ten feet of the location is secured and no students are present within the secured area
- Applications to outdoor school grounds if students are not expected to be present within twenty feet of the application site. These areas must be clearly marked or secured by a fence or similar barrier
- All pesticide use dilutions must be prepared outside student occupied areas
- All services must be consistent with any written pest management policy of that school
- Liquid termiticide applications in schools must be performed when children are not present and are not expected to be present for 3 hours or longer
- Termiticide bait applications may be performed when children are not present within (20) feet of the application site

Precautions - To avoid accidental injury or poisoning of humans and animals all pesticide applications must be made consistent with all label or labeling directions. Applications must also avoid contamination of the environment.

#### Fair Business Practices Act

The Georgia Office of Consumer Affairs administers the Fair Business Practices Act. It requires all contracts signed at the customer's home or business contain a notice that the contract may be canceled for up to three business days after signing. It also requires that all work will be done in a quality manner.

#### Hazardous Waste Management Act

In 1979 Georgia passed the Georgia Hazardous Waste Management Act to follow the Federal Resource Conservation and Recovery Act (RCRA). This law protects human health and the environment from improper activities involving hazardous waste.

In the future, changes will continue in both federal and state regulations. Anyone who produces hazardous waste should stay advised about changes through their trade organizations or through the Georgia Environmental Protection Division, Hazardous Waste Management Program.

## Pesticide Use and Application Act

The Georgia Department of Agriculture also enforces the Georgia Pesticide Use and Application Act. This law deals with the regulation and licensing of some areas related to structural pest control. These include areas such as mosquito control and applications of pesticides to lawns. You may obtain additional information about this program at (404) 656-4958.

## CHAPTER 3

### PEST BIOLOGY AND IDENTIFICATION

The first step in solving any problem is to understand what is causing it. So the first step in your job is to recognize the pests you need to control.

We favor the development of the plants and animals that provide us food and fiber. However, we also provide good growing conditions for other plants and animals that can harm them. The living things that compete with us for food or fiber, or attack us directly are called pests. The living plant or animal a pest depends on for survival is a host.

The pests we deal with can be put into groups:

- insects (including mites, ticks, and spiders)
- vertebrates (rats and mice)
- wood decay fungi

Most technicians know most of the common pests that they see on the job. Sometimes an unfamiliar pest may appear. Identification publications, websites and pictures are available to help you find out what they are. You also can contact local experts such as the county extension service for help.

#### Insects

Insects thrive in more environments than any other group of animals. They live on the earth's surface, in the soil, and in the water. They are at home in deserts, rain forests, hot springs, snow fields, and dark caves.

Insects feed on a wide variety of food. Even after harvest, insects can continue to damage stored or processed products. Insects also feed on man and animals. Some of these pests carry disease(s) that have caused millions of deaths to man and animals.

Most insects, however, are beneficial. Many help man by pollinating plants or feeding on other insect pests.

All adult insects (not mites, ticks, and spiders) have two things in common. They all have six jointed legs and three body regions. The three body regions are head, thorax, and abdomen. The most important items to look at when identifying an insect, are the wings and the mouthparts.

Some insects have no wings. Others have two or four wings. The wings vary in shape, size, thickness, and structure.

The type of mouthparts of insects varies widely. Many insects such as beetles and cockroaches have chewing mouthparts. They have toothed jaws that bite and tear food. Insects such as fleas and mosquitoes have piercing-sucking mouthparts. They have a

long beak that they force into a plant or animal to suck out fluids or blood. Insects do not have an internal skeleton as do humans. An insect's skin serves as its skeleton. It is an exoskeleton. The muscles of an insect are attached to its exoskeleton.

The exoskeleton can only stretch so much. Periodically the insect must shed the old exoskeleton and grow a new one. This is a molt. Insects will go through several molts as they grow. The period between molts is known as an instar.

Most insects change in shape, form and size during their lives. This is metamorphosis. There are several different types of metamorphosis.

Without Metamorphosis - Insects such as silverfish develop without metamorphosis. Growth is by a series of molts. Each stage looks like the one before except for size. Food and habits for the young and the adults are alike. Only the adult is sexually mature.

Gradual Metamorphosis - Insects such as cockroaches, termites, bedbugs, and earwigs have gradual metamorphosis. There are three distinct stages in their development: egg, nymph (several of these), and adult. The nymphs are similar to the adult in appearance, food, and habits. The change in appearance is very gradual. Wings develop appearing fully developed in the adult.

Incomplete Metamorphosis - Insects such as dragonflies, damselflies, and mayflies have incomplete metamorphosis. The young are known as naiads. They have a different body structure and a completely different mode of life than the adults. The naiads are adapted for living in water. The adults live on dry land and can fly. The wings develop only in the adult. This group of insects is of little concern to the pest control operator.

Complete Metamorphosis - Insects such as beetles, moths, butterflies, flies, fleas, ants, bees, and wasps have complete metamorphosis. This group has four separate stages: egg, larva, pupa, and adult. The larva hatches from the egg and looks very different from the other stages. It may live in different situations and feed on different foods than the adult. The pupa is a stage that does not feed. It is a "resting stage." The insect changes from the larvae to the adult in the pupa stage. Here the legs, wings, and antennae become fully developed. The adult emerges from the pupa stage.

### General Pests

There are over one million different species of insects. Fortunately, only a relatively few are of concern to the pest control operator. You should be familiar with the most common of these insects. Some of these are described below.

#### German Cockroach

- Adults are 1/2 inch long
- Tan with two dark strips running lengthwise on the area behind the head

- The most common species encountered in structures
- Often occur in large numbers

#### American Cockroach

- Largest of the common cockroaches; about 1 1/2 inches long
- Reddish brown with the margins of the thorax lighter
- May live out of doors in warmer areas
- Prefer moist dark areas
- Have fully developed wings and can glide long distances

#### Smokybrown Cockroach

- Adults are 1 1/4 inches long
- Uniformly dark brown in color
- May live outdoors in warmer months and move indoors when cool
- May be found throughout the structure
- Fully developed wings
- Large egg case
- Attracted to light

#### Brown-Banded Cockroach

- Adults are 1/2 inch long
- Brown with two lighter bands across the base of the wings and abdomen
- May be found throughout the structure, mainly in hot dry areas
- Glues egg case to objects such as furniture

#### Oriental Cockroach

- Adults are 1 inch long
- Very dark brown to black in color
- Adult female has only wing pads
- Adult male has wings that cover 3/4 of the abdomen
- Found in damp places such as basements and sewer lines

All these cockroaches can carry the diseases responsible for food poisoning and can cause allergies.

#### Fleas

- Adults are 1/8 to 1/6 inch long
- Adults are dark brown, flattened side to side, and have no wings
- Adults feed on the blood of warm blooded animals. The larvae feed on organic debris including dried blood
- Eggs are laid on the host and fall off
- Can carry diseases such as plague and tapeworms

#### Ticks

- Ticks are flattened from top to bottom

- Adult ticks have 8 legs
- Larvae have 6 legs
- They are not insects
- All stages feed on blood
- Can carry Lyme disease and Rocky Mountain Spotted Fever

Stored Product Pests (such as rice weevil, saw-toothed grain beetle, confused and red flour beetle, the drugstore and cigarette beetle and Indian meal moth)

- May feed on whole, damaged, or milled products
- Generally have low moisture requirements
- Can spread throughout a kitchen
- May spread through the house on dried flower arrangements and potpourri
- Usually very small in size

Fabric Pests (such as clothes moths and carpet beetles)

- Damage is caused by the larvae
- Feed mainly on animal fibers: wool, silk, fur, and feathers
- Do not feed on cotton but can damage mixed fiber material

Ants

- Ants are social insects (they live in a colony)
- May sting
- Most ants will feed on a wide variety of foods
- Ants have three types of castes in a colony: workers, males, and females
- Workers in a colony may be different sizes.
- Different ants may require different types of control

Flies (such as house fly, cluster fly, drain fly, blow fly and mosquitoes)

- Can carry many diseases
- The larva is called a maggot
- Adults only have two wings

Silverfish

- Gray to brown in color
- Adults are 1/2 inch in length
- Have three long projections at the end of the body
- Feed on almost anything containing proteins or sugars

Spiders

- Spiders are not insects
- Spiders have 8 legs
- Only the black widow and the brown recluse are dangerous
- Most are beneficial because they feed on insects

Bedbugs

- Blood feeding parasite
- Adults, before feeding are about 1/3 inch in length
- After feeding the body is often red and swollen
- May produce a foul odor
- Easily transported from one location to another by man
- Significant increase in number of complaints in the past several years

## Termites

Termites are social insects. They mainly feed on the cellulose found in wood. They live in colonies where there is a division of labor between the different types of termites in the colony. Nearly all species have reproductive and soldier castes and many have a worker caste. Food gathering and nest building is by the nymphs and, if present, the workers. The nymphs and workers are responsible for damage to wood.

The primary reproductive caste, at some time in their life, has wings. They swarm from the colony, usually in the spring, to spread out and form new colonies. The soldier caste serves to protect the colony from its enemies.

Swarming termites and swarming ants look similar. They can be separated by the following traits:

<u>Trait</u>	<u>Termite</u>	<u>Ant</u>
Antennae	Straight	Elbowed (Bent)
Wings	2 pair equal length	2 pair unequal length
Waist	Broadly joined	Narrow waist

There are two different types of termites that are common in Georgia. They are the subterranean termites, including the Formosan termite, and dry-wood termites.

### Subterranean Termites, including the Formosan termite

- Colony is usually located below the ground
- Has a worker caste
- Use soil and excrement to build shelter tubes
- Swarm in the early part of the day (Formosans will swarm in the evening)

### Drywood Termites

- Do not require contact with the ground as do subterranean termites
- Produce hard fecal pellets with six distinct concave surfaces
- Have much smaller colonies than do subterranean termites
- Swarm in the late evening or at night

### Carpenter Ants

- Carpenter ants do not eat wood but chew it out to nest in it
- Are the largest ants found in Georgia



- Prefer to nest in wood that is slightly decayed
- Leave small wood shavings outside nest area

#### Powderpost Beetles

- There are several different types which can attack different types of wood
- The most common in structures is the Anobiid powder post beetle which attacks softwood (pines)
- The one that most often attacks hardwood (oak, maple, hickory) is the Lyctid powder post beetle
- Adults produce small exit holes in the wood
- Life cycle usually takes 1 - 3 years

#### Old House Borers

- Adults are 3/4 inch long
- Attacks wood that is less than 10 years old
- Life cycle usually takes 3 - 12 years
- Produce galleries in the wood with a ripple pattern
- Adults produce exit holes that are oval and 1/4 - 3/8 inch in diameter

#### Wood Decay Fungi

- Wood decay occurs due to the activity of a fungus
- Water does not rot wood
- Wood decay fungi occurs only when the moisture content of the wood exceeds 28%
- Wood decay fungi attacks the cell walls of wood causing it to weaken
- Surface molds do not damage wood; they start to grow at a wood moisture content of 20%
- If the wood moisture content is lowered, the fungi will stop growing
- Chemical control of fungi may not be necessary

#### Rodents

Domestic rodents live with humans and depend on food intended for man and his animals. Rats eat about 20 - 40 pounds of food a year. They will, however, contaminate much more with their urine, feces and hair.

Rodents carry the diseases responsible for food poisoning and other diseases such as typhoid. They have the habit of constantly gnawing on hard surfaces. This gnawing can damage electrical wires and start fires.

There are three common rodents found in Georgia. All live for about 1 year. They have poor eyesight and are color blind. They also have excellent senses of hearing, taste, and smell.

#### Norway Rat

- Large, robust in appearance, weighing up to 18 ounces
- Has small eyes, small ears, and a blunt snout
- Usually nests in the ground
- Will eat anything but prefer meats
- Has 4 - 7 litters per year with 8 - 12 young per litter
- Shy around new objects

#### Roof Rat

- Sleek appearance, weighing up to 9 ounces
- Has large eyes, large ears, and a pointed snout
- Usually nests in vines, walls, and attics
- Will eat anything but prefer fruits and vegetables
- Has 4 - 6 litters per year with 4 - 8 young per litter
- Shy around new objects

#### House Mouse

- Slender appearance, weighing up to 1 ounce
- Has small eyes, large ears, and a pointed snout
- Usually nests within structures
- Will eat anything but prefer grains
- Has 8 litters per year with 4 - 7 young per litter
- Inquisitive about new objects

## CHAPTER 4 PESTICIDES

A pesticide is any chemical or mixture of chemicals used to kill or control the activity of a pest. A pesticide may also be used to attract, or repel a pest, as well as to change the normal growth or reproductive activities or otherwise regulate the activities of the pest. The type of pest controlled by the different types of pesticides is often indicated by the names shown in the following chart:

<u>Pesticide</u>	<u>Activity</u>
insecticide	kills or controls insects
rodenticide	kills or controls rodents
avicide	kills or controls birds
miticide	kills or controls mites
insect growth regulator (IGR)	regulates the growth or reproduction of insects
repellent	moves a pest away from an area
attractant	moves a pest to an area
acaricide	kills or controls mites, ticks and spiders
nematicide	kills or controls nematodes
molluscicide	kills or controls snails and slugs
desiccant	removes moisture from the body of a pest

### How Pesticides Enter the Body of Arthropods and Similar Pests

To work, a pesticide must enter the pest's body. This can happen in several different ways:

**Mouth** - Chemicals may enter body through the mouth when a pest eats the pesticide or cleans its body parts (e.g. when a cockroach cleans its antennae). These chemicals enter the stomach and are absorbed into the body. They are stomach poisons. They can also include pesticide baits.

**Body** - Many pesticides can pass through the body wall of the pest. They are contact poisons. Many emulsifiable concentrates are contact poisons.

**Inhalation** - Many pests have openings in their body wall for the exchange of air. These openings are spiracles. Certain pesticides such as fumigants and fine aerosols can enter the pest's body through the spiracles.

**Desiccants** - This type of pesticide does not actually enter the pest's body. Contact with the chemical removes or changes the protective body coating. This results in the loss of body moisture and death results from dehydration.

### Pesticide Formulations

There are many different types of pesticide formulations. Each has advantages and disadvantages. You must consider several different factors when choosing the type of pesticide formulation. Some of the factors to consider are:

- application site
- exposure of humans and domestic animals
- pest to be controlled
- type of application equipment
- environmental safety

### Emulsifiable Concentrates (EC or E)

An emulsifiable concentrate consists of a pesticide mixed with a solvent and an emulsifier. An emulsifier is a detergent like material that will allow oil droplets (chemical and solvent) to be suspended in and mixed with the water. This emulsifier will cause the diluted material to take on a milky appearance. Some emulsifiable concentrates will remain mixed for long periods with little agitation. Others will require moderate agitation to prevent them from settling.

The advantages of using an emulsifiable concentrate are:

- no visible residues when applied properly
- easy to mix
- only moderate to little agitation needed
- harmless to most surfaces
- most have good residual life

The disadvantages of using an emulsifiable concentrate are:

- may damage sprayer parts if left standing overnight
- harmful to many plants (usually caused by the solvents)
- quickly absorbed by porous materials such as unfinished wood and concrete thus reducing availability

### Microencapsulated Pesticides (ME or FM)

Microencapsulated pesticides are made by enclosing tiny droplets of the chemical in very small plastic spheres. As these spheres break down, they slowly release the pesticide. The release is gradual, giving a long residual life. These materials are diluted (mixed), usually with water, before application.

The advantages of using a microencapsulated pesticide are:

- low toxicity to humans and domestic animals
- the diluted material has a long storage life
- low repellency to most pests
- remains on the surface of porous materials providing long residual life

The disadvantages of using a microencapsulated pesticide are:

- require frequent agitation
- can leave a visible residue

### Wettable Powders (W or WP)

Wettable powders are made by applying the pesticide to the surface of a dust-like particle. Then a wetting agent is added so it can be mixed with water. The wetting agent increases the ability of the water and the powder to mix. The wettable powder does not dissolve in the water like sugar does. Instead, each individual particle becomes suspended in the water.

The advantages of using a wettable powder are:

- remains on the surface of porous materials providing long residual life
- low toxicity to plants
- not readily absorbed by the skin of humans and domestic animals

The disadvantages of using a wettable powder are:

- requires very frequent agitation
- leaves visible residue on many surfaces, especially dark surfaces
- easily inhaled by the applicator when mixing
- produces wear on spray nozzles due to abrasion

### Dusts (D)

Dusts are finely ground solid particles of the chemical mixed with a fine inert powder such as clay or talc. They may act as a stomach poison or a contact poison or both. Many desiccants are applied as dusts.

Dusts, when applied properly, will remain effective for a long time. If, however, they become damp, they will tend to clump together and become ineffective. Over application of dusts (too thick) may cause the pesticide to repel the pest, making them ineffective.

The advantages of using a dust are:

- long residual life if kept dry
- ready to use
- remains on the surface of porous materials, providing long residual life
- not readily absorbed by the skin of humans or domestic animals

The disadvantages of using dusts are:

- leaves highly visible residue
- can be difficult to control application
- can become airborne and drift to other areas
- may be breathed

### Baits

Bait is a formulation of a pesticide that can be eaten. It contains a material to make the formulation attractive to the pest. Baits come in several forms such as granules, pastes, gels, liquids, tablets, and blocks. Baits can also include application of the chemical to foods such as seeds and fruits. Baits control many different pests including rodents and birds.

The advantages of using baits are:

- controlled placement
- most have long residual life
- most are ready to use
- easy to apply

The disadvantages of using baits are:

- must compete with other available foods
- may be attractive to humans and domestic animals
- may cause odor problems

### Granules (G)

Granular pesticides are dry materials coated with the chemical. Coarse, porous particles such as ground up corn cobs, walnut or pecan shells, or clay are used. Granules are much larger than dusts and are not eaten. They must be kept dry until application. After application the granules absorb ground moisture and slowly release the pesticide. This provides long residual life. Heavy rains after application can shorten the residual life.

The advantages of using granules are:

- low drift hazard
- easy to apply
- pre-mixed
- long residual life

The disadvantages of using granules are:

- more expensive than many other types of formulations
- less residual life if heavy rains occur after application
- may be ineffective during very dry weather

### Oil Concentrates

Oil concentrates are solvents with the chemical dissolved in them. Most oil concentrates are used in ultra low volume (ULV) equipment. They are applied as non-residual contact insecticides.

The advantages of using an oil concentrate are:

- acts quickly on the pest

- penetrates into cracks and crevices where pests hide
- safe to use around electrical equipment
- treats large volumes of space rapidly

The disadvantages of using an oil concentrate are:

- readily absorbed by porous surfaces
- the solvents may damage wire insulation and sprayer parts
- flammable (do not use near open flames or in high heat areas)
- toxic to plants
- chemical will settle when cold (must be stored in warm areas)

### Pesticide Types

Pesticides are classified into different chemical groups or types. The common ones used in the pest control industry include inorganic, botanical, organophosphates, carbamates, chlorinated hydrocarbons, synthetic pyrethrum or pyrethroids, insect growth regulators, pheromones, anticoagulants, and fumigants.

#### Inorganic Pesticides

Inorganic pesticides are minerals. Most of these are toxic to humans and domestic animals as well as many pests. Most inorganic pesticides are slow acting, non-repellent, and show little sign of resistance. They are produced from copper, boron, lead, mercury, sulfur, tin, or zinc. They are very persistent. They act as stomach poisons or desiccants. Some examples of inorganic pesticides are: boric acid, silica aerogel, zinc phosphide.

#### Botanical Pesticides

Botanical pesticides are made from plants or parts of plants. They usually break down shortly after application. Some examples of botanical pesticides are: pyrethrins, rotenone, red squill, strychnine, and nicotine. Of these, only pyrethrins are still widely used.

#### Organophosphate Pesticides

Organophosphate pesticides affect the nervous system of insects, as well as humans and domestic animals. They affect the normal function of certain types of chemicals found in the nerve. They were, at one time, one of the most widely used group of chemicals in the pest control industry. However, many organophosphate insecticides are either no longer available or the use of the products has been significantly limited. Insects are slow to develop resistance to most of these pesticides. They are usually effective for several weeks after application.

#### Carbamates

Carbamates are similar to the organophosphates in the way they work. However, they are usually less toxic to humans and domestic animals. Like organophosphates, many carbamates are no longer available or have limited uses. They are also active for several weeks after application. Insects develop resistance to carbamates faster than organophosphates.

### Chlorinated Hydrocarbons

Chlorinated hydrocarbon pesticides, such as Chlordane, Aldrin, Dieldrin, and DDT, were widely used in the pest control industry at one time. These chemicals are extremely long lasting. Some require over 50 years to break down. As a result, most of these are no longer used today. Some however, still have very limited uses.

### Synthetic Pyrethrum or Pyrethroids

Synthetic pyrethroids are man made products that are similar to natural pyrethrins. However, they usually have a much longer residual life. Most insects develop resistance to these products rapidly. As with natural pyrethrins these chemicals are low in toxicity to humans and domestic animals. However, they are extremely toxic to fish and birds.

### Novel Chemical Compounds

The newer products available today have a variety of chemical properties that do not fit into an easily defined category. These chemicals are relatively new to the market. They are usually low in toxicity to humans and domestic animals. They are also, usually, low in the amount of active ingredients. These chemicals affect insects in a number of different ways and are frequently not repellent to the target insect.

### Insect Growth Regulators (IGR'S)

Insect growth regulators are man made materials that are similar to natural chemicals found in an insect's body. These chemicals inhibit or delay the development of internal organs. This results in sterility or affects normal development. They are very low in toxicity to humans and domestic animals since they are found only in insects.

### Pheromones

Pheromones are sex attractants from special glands of one or both sexes of a pest. They are usually effective for only a single type of a pest. They are very expensive and available in only limited quantities. Pheromones are used to attract insects to traps and to monitor pest populations.

### Anticoagulants

Anticoagulants are chemicals that prevent the blood of mammals from clotting. There are two different types:

- single dose - a lethal dose is usually obtained in one feeding with death occurring in 5 - 7 days
- multiple dose - feeding is required for 3 - 5 days with death occurring in 5 - 7 days.

### Fumigants

Fumigants are pesticides that are gases at room temperature. They are capable of penetrating wood, concrete blocks, and other porous building materials. They have no residual activity. They are used in the pest control industry to control wood destroying organisms and stored product pests.

### Pest Control Devices



There are a number of pest control devices that should be used when possible. They have the advantage over pesticides in that they are nontoxic and have little effect on the environment. Such devices are called mechanical pest control devices and include air curtains, sticky boards, electrocutor traps, live traps, glue boards, snap traps, multiple catch traps, protective netting, porcupine wires.

#### Air Curtains

Air curtains or air doors are fan type devices placed over door ways that direct an air current downward. This prevents flying insects from entering. They can reduce the number of these pests that enter a building.

#### Sticky Boards

Sticky boards or traps are used to determine the numbers of a pest and to locate pest nesting areas. They can be used to eliminate small pest infestations. They are of limited use in controlling established pest problems.

#### Electrocutor Traps

Electrocutor traps use ultraviolet light (UV) to attract some flying insects. When the insect enters the trap they are killed when they touch an electric grid inside the trap. They are effective for only 20 - 30 feet and must be placed away from the area to be protected. If placed in the area you are trying to protect, they may actually attract more insects to that area. Electrocutor traps are not effective on mosquito populations.

#### Live Traps

Live traps capture rodents and other small mammals without harming them. The animals can then be released several miles away from the area where captured. If released near the area where captured, they may return. It is very important to inspect these traps daily and release any captured animals.

#### Glue Boards, Snap Traps, and Multiple Catch Traps

Glue boards, snap traps, and multiple catch traps are common devices used for rodent control. These devices can be very helpful in controlling rodent infestation. It is important to inspect these traps frequently and clean them as necessary. Dead animals left in these traps will begin to decay and smell. They may also be attractive to insects that feed on dead animals.

#### Protective Netting and Porcupine Wire

Protective netting and porcupine wire are used in bird control. The netting is placed over the area to be protected. This prevents the birds from entering. Porcupine wire is a type of device that has many wires projecting out from it. The wire is attached to ledges, lights, statues, etc. and prevents the birds from landing on that surface.

#### Ultrasonic Pest Control Devices

Research reports in scientific journals have demonstrated that ultrasonic pest management devices do not kill, repel, or eliminate insect or rodent pests. Accordingly, they are of little use or value in the professional pest management industry.

## CHAPTER 5

### HOW TO READ A LABEL AND A MATERIAL SAFETY DATA SHEET

The label on a pesticide and the material safety data sheet (MSDS) provide information about the pesticide and its application. The label is the legal document under FIFRA. It provides information on the use, storage, and disposal of the pesticide. Remember - the label is the law. It is a violation of both state and federal law to use a pesticide inconsistent with the label directions.

#### Labels

As stated above, the label is the law. Some labels are easy to understand while others are complicated. All labels, however, must provide certain basic information, such as:

##### Product Name

Each company has a product name for each of its chemical products. It is a brand name or a trade name. The product name is the most prominent name on the label and the one used in advertisements. Applicators must be careful about choosing a pesticide by product name alone. Companies may use the same product name for slightly different pesticides.

In addition, different companies may use different names for the same active ingredient.

##### Common Name

Most pesticides have complex chemical names known as the active ingredient. Many have another name to make them easier to identify. This is the common name. A pesticide may have several different product names but will always have the same common or chemical name.

##### Type of Formulation

There are different types of pesticide formulations, such as emulsifiable concentrates, wettable powders, dusts, or granules. They require different methods of handling and application. The type of formulation is shown on the label. The same active ingredient may be available in more than one type of formulation.

##### Ingredient Statement

Every pesticide label must show what is in the product. You must be able to distinguish the actual pesticide from inert ingredients. Certain solvents, such as xylene, petroleum hydrocarbons or aromatic petroleum solvents may have doubtful or limited pesticide value but may be listed as an active ingredient.

Each active ingredient is given as a percentage by weight. In addition, the pounds of

actual pesticide per gallon of a liquid concentrate are given at the bottom of the ingredient statement. The pesticide is listed by either the chemical or common name.

The label shows what percent of the total weight are inert ingredients. The listing of the names of the inert ingredients is not required.

#### Net Contents

The net contents on the front panel of the label tell how much formulation is in the container. It is shown in gallons, quarts, or ounces for liquids and pounds or ounces for dry formulations.

#### Name and Address of the Manufacturer

The manufacturer or distributor of a pesticide must put its name and address on the label.

#### Registration and Establishment Numbers

EPA registers every pesticide. Each pesticide has its own separate registration number. This number must appear on the label, usually on the front panel. It appears as EPA Registration No. xxxx-xxxx.

All manufacturers must also register with EPA. Each separate manufacturing facility is required to have a separate establishment number. This number must be on the label of the pesticide container.

#### Signal Words and Symbols

Pesticides by their nature are toxic substances and may be hazardous. Every pesticide label includes a signal word which shows how potentially dangerous the pesticide is to humans, animals, and the environment. You can tell about how toxic the material is by the signal word and symbol. However, customers should not be told that the products that are used are safe or non-toxic.

Single words are based on five criteria of exposure to laboratory animals:

- Swallowing
- Applied to the skin
- Inhaled
- Irritation or corrosiveness to the skin
- Irritation or corrosiveness to the eye

The signal word must appear in large letters on the front panel of the label. It is followed by the statement "Keep Out of Reach of Children."

The signal words, symbols, and estimated human toxicity are as follows:

Danger - The pesticide is highly toxic. A taste, to a teaspoonful of the undiluted product, taken by mouth, can kill an average sized adult. If the label carries the signal word Danger, it will also carry the word Poison. It is printed in red with the symbol of skull and crossbones. Many restricted use pesticides carry these words and symbols.

Warning - The pesticide is moderately toxic. A teaspoonful to a tablespoonful of the undiluted product, taken by mouth, can kill an average sized adult. It carries no symbol.

Caution - The pesticide is slightly toxic. An ounce to more than a pint of the undiluted product, taken by mouth, can kill an average sized adult. It carries no symbol.

### Precautionary Statements

All pesticide labels contain precautionary statements. Sometimes these statements are listed under the heading "Hazards to Humans and Domestic Animals." Precautionary Statements are as follows:

Statement of Practical Treatment - These statements are the first aid treatments recommended in case of poisoning. All Danger and some Warning and Caution labels contain a section for physicians describing the appropriate medical procedure for poisoning emergencies. They may also identify an antidote.

Environmental Hazard - Pesticides are useful tools but if used improperly may harm the environment. The label contains precautions concerning hazards to the environment. Some pesticides are classified as Restricted Use because of potential environmental hazards.

Physical or Chemical Hazards - The label notes any special potential hazards such as fire or explosion that the pesticide may pose.

### Classification Statement

Every pesticide is classified by EPA for either General Use or Restricted Use. The hazard of poisoning, the application method, and the effect on the environment determine the classification.

The front panel on a Restricted Use Pesticide will contain the following statement: RESTRICTED USE PESTICIDE. For retail sale to and use only by certified applicators or persons under their direct supervision and only for those uses covered by the certified applicator's certification.

### Directions for Use

The directions for use include details on the proper and safe way to apply the pesticide. These use instructions will show:

- the pests the product is labeled to control
- the area where the product may be applied
- in what form the product is to be applied
- how much to use

- mixing directions
- compatibility with other often used products
- phytotoxicity or staining problems
- when application should be made
- proper equipment to use

#### Misuse Statement

This section serves as a reminder that it is against the law to use a pesticide inconsistent with its label directions.

#### Re-entry Statement

This section advises the time necessary before a pesticide treated area is safe for entry by a person without protective clothing. This statement will not appear if no re-entry time is needed.

#### Storage and Disposal

Every pesticide must be stored and disposed of correctly. This section will give directions for the storage and disposal of the pesticide and pesticide containers.

Labels of pesticides are constantly changing. Review labels periodically to assure that the product is applied following all directions and conditions of use. Knowing and following the directions on the label will ensure your correct use of each pesticide.

#### Labeling

All printed material, such as guidance documents, technical bulletins, material safety data sheets and similar materials that are produced by the registrant or manufacturer of a pesticide is called labeling. Labeling is enforceable just the same as the actual label.

#### Material Safety Data Sheet

The Material Safety Data Sheet (MSDS) provides additional information that is not normally found on the label. This information will include:

- product information
- health and safety information
- first aid and procedures
- information for a physician
- fire and explosion information
- spill and clean-up information
- product disposal
- special precautions
- toxicological information

## CHAPTER 6

### EQUIPMENT USED IN THE PEST CONTROL INDUSTRY INCLUDING CARE, MAINTENANCE, AND CALIBRATION

Any good craftsman must have good tools to go with their training and experience. So is the case with a pest management professional (PMP). Selecting a piece of equipment that is suited to the job at hand and knowing how to use that equipment properly, will insure a satisfied customer. All equipment must be well maintained to work properly.

#### Compressed Air Sprayer

A commonly used piece of equipment in the pest control industry is the stainless steel compressed air sprayer. It is very efficient in delivering pesticides to a specific area and if cared for properly is highly durable. It is very important to keep this piece of equipment clean and in proper working order. A well planned and properly followed maintenance program is a must in preventing embarrassing and costly damages as a result of faulty equipment.

#### Filling and pressurizing the compressed air sprayer

Filling a compressed air sprayer is not as simple as it may seem. You should always follow the directions on the pesticide label when mixing the pesticide. Many labels require that you fill the tank halfway with water, add the proper amount of pesticide, replace the top of the sprayer and shake. After shaking you must add water to the fill line, replace the top, and shake again.

Many pesticide formulations such as emulsifiable concentrates will require very little additional agitation when used the day they were mixed. Some pesticide formulations such as wettable powders and microencapsulations settle out rapidly so you must shake the material often to be sure of a proper mixture. Most pesticides are applied at low pressures (around 20 - 30 psi). This will prevent splash-back or splattering of the pesticide. To achieve low pressure in a full one gallon sprayer in good working condition it should be pumped no more than 3 - 4 times. Any additional pumps will result in over-pressurization of the tank. As the pesticide is used, the pressure in the tank will drop. When this occurs additional pressurization is necessary. Usually 1 - 2 pumps will return the pressure to proper amount.

#### Routine Maintenance

Tank - Many people believe that stainless steel is not subject to rust and corrosion. The pesticides used in the structural pest control industry, however, contain ingredients which can cause the stainless steel tanks to corrode. A sprayer used daily should be thoroughly cleaned at least once a week. When cleaning the tank you should use hot water and ammonia. A long handled bottle brush is used to brush the inside areas of the tank. It is best to leave the cleaning solution in the tank for about 10 - 15 minutes. You should also keep the outside of the tank clean and inspect for pinholes.

Pinholes in the tank should be examined by someone who is familiar with welding stainless steel. Do not attempt to patch the tank with liquid steel or similar type products.

After cleaning, rinse the tank and empty it. Check and clean the strainer when necessary. Then add more ammonia and hot water, pressurize the tank, and squeeze the trigger to flush the hose and valve assembly. After flushing, release the pressure and hold the hose and valve assembly above the tank and squeeze the trigger to drain it. This is known as back flushing. Back flushing should also be performed at the end of each work day so no chemical is left in hose and valve assembly.

All excess pesticide and rinse material must be disposed of properly. One of the common ways to dispose of this material is to place it in the termite spray tank. This way the material is placed in the ground during a termite treatment. Never pour excess pesticide or rinse material down the drain. Be sure to read and follow all label directions for disposal of excess pesticide and rinsate as some pesticides prohibit application to soils.

**Pump Assembly** - The pump assembly consists of a pump cylinder with a check valve in the bottom, and a plunger assembly. The check valve should be inspected for dirt or grit that can accumulate under it. A valve that is worn or swollen must be replaced. Next check the lip of the pump cylinder for cracks. Also check the tank gasket for wear. Worn or cracked gaskets must be replaced. Neats-foot oil or similar type material should be rubbed into the interior cup leather. Do not use WD-40 or other similar type of spray lubricants.

**Hose** - Inspect the hose for cracks, swollen or soft areas, or areas that appear worn, and replace immediately. Use care when tightening the hose on the tank to prevent over tightening. Inside the hose fitting there is a small polyethylene washer that can be crushed and may clog the hose if over tightened.

**Shut-Off Valve** - The valves generally have two gaskets, the soft seat gasket and the valve packing. Valve packings have a tendency to expand and contract with temperature changes. A 3/8 inch wrench is used to tighten it. Do not tighten too much or the packing will close up on the cable preventing the trigger from returning to its normal position. When replacing the packings do not use wire to remove them. Instead, a small phillips head screwdriver can be used to remove them.

**Nozzle Tips** - The tips are cleaned with hot water and a tooth brush. DO NOT use a wire to unclog the tip or you will damage the opening.

**Strainer** - The strainer should be cleaned with hot water and a tooth brush. If the strainer can not be cleaned replace it. Do not use the sprayer without a strainer.

Remember, keeping your sprayer well maintained assures both the homeowner and yourself safer pest control applications.

## Trouble Shooting with a Compressed Air Sprayer

Problem	Cause	Solution
Tank not building pressure	Leather cup worn Leather cup missing	Oil or Replace Replace
Tank not holding pressure	Cap won't tighten Tank gasket worn	Tighten Replace
Cylinder filling with liquid	Dirt under check Valve worn	Clean Replace
Holds pressure toothbrush won't spray toothbrush	Tip clogged  Strainer clogged	Clean with  Clean with
Tip leaking tighten	Tip not on properly  Dirt in seat gasket Seat gasket worn Valve spring broken	Straighten &  Clean Replace Replace
Valve body leaking remember to  you	Packing nut loose	Tighten -  work trigger as  tighten to prevent over tightening
Hose leaks	Hose worn	Replace
Hose leaks near tank	Teflon washer worn Teflon washer missing	Replace Replace
Hose clogged night and	Swollen from chemical  left in tank with tank pressurized	Clean each  release pressure

Emergency Procedure - If the hose suddenly breaks turn the tank upside down. This will allow the pressure to escape but not the chemical.

### Large Spray Equipment



Most spray units used today for termite control or yard spraying have gasoline powered engines. You should always follow the maintenance procedures furnished with the equipment. To prevent accidental starting of the equipment, always remove the spark plug or disconnect the spark plug wire before servicing.

Pumps - Most spray rigs use roller pumps. These pumps require daily oiling to prevent damage to the rollers.

Hoses - Inspect hoses daily. If they have soft spots, cracks, or swollen areas replace them immediately. Also be sure to check the bypass agitation hose.

Strainers - Strainers should be checked weekly. If cleaning is needed, use warm water and detergent. If the unit has an inline strainer inspect it for cracks or wear.

Winterization - Cold temperatures can be very damaging to spray equipment. To prevent freezing you should, if possible, drain all chemical from the tank. After draining pour a mixture of water and anti-freeze into the tank and run the pump spraying the mixture through the hose. This will allow the anti-freeze to protect the pump and hose.

Inspect all valves and connections for leaks on a daily basis.

### Dusters

Hand Dusters - The most common types of hand dusters are the bulb duster and the bellows dusters. When using the bellows duster you should always remember to hold it so the stem is at the top. Attempting to use it with the stem at the bottom will result in over application of the pesticide. The duster is squeezed lightly to produce a thin layer of dust. Over application will cause insects to avoid the pesticide.

Power Dusters - This type of duster is commonly powered by a fan. It is used to treat large areas such as wall voids, attics, and crawl spaces.

### Back-flow Preventers

Back-flow preventers are just what the name implies; they prevent water and pesticides from being drawn back into the water supply system when filling tanks with a hose if a sudden drop in water pressure occurs.

### Aerosol Application Equipment

Aerosol application equipment has become a major component in the pest control industry in recent years. This type of pesticide delivery system can be very effective and cost efficient. When properly used, this system requires very little maintenance.

### Additional Safety Precaution

If a hose ruptures, immediately turn off the system. Cover the hole with a paper towel if available. Empty the equipment and make all repairs outside where contamination is less likely to occur. Refer to the product label directions for instructions if some of the pesticide is inhaled, gets in the eyes, or on the skin.

If a slow leak develops in the hose or equipment turn off the valve on the system. Wrap the leaking area with a paper towel if available. Empty the equipment and make all repairs outside where contamination is less likely to occur.

### Calibration of Equipment

Calibration is best defined as adjusting the equipment so as to apply the desired rate of pesticide. Calibration is important for an accurate application. If equipment is not properly calibrated you may not apply the proper volume of pesticide. Over application of a pesticide may pose a hazard to you, your customer, or the environment. Under application may result in an ineffective treatment.

The following is a simple method for calibrating spray equipment.

Start the pump on your large spray rig, let it run at normal operating pressure. For a compressed air sprayer, pump the sprayer up to normal operating pressure. Using your standard hose and application tool open the valve and let the chemical run into a container, using a watch, measure the time it takes to put out one gallon. Repeat this procedure three times to assure accuracy. From this time you may calculate the flow rate in gallons per minute or ounces per second.

Any time you change nozzles or treating tips or adjust the pressure you must recalibrate.

### Suggested Reading

There are many more types of equipment available to you. For further information you may consult:

- Manufacturers instruction booklets that are supplied with the equipment
- “Truman’s Scientific Guide to Pest Control Operations”, Truman et. al.
- “Handbook of Pest Control”, Mallis

Your job will be easier when your tools and equipment are reliable and present a professional image to your customers.

## CHAPTER 7 APPLICATION TECHNIQUES

Pesticide application today is the controlled placement of a pesticide to an area where the

pest is likely to contact the chemical. As a rule, low pressure is the key to this controlled placement.

### Pest Control Application

How the pesticide is applied is the most important factor in effective and safe pest control. The most effective pesticide will not overcome improper use. Proper application can make the use of highly toxic chemicals low in risk to man, animals, and the environment.

There are certain basic steps that are followed in any pest control procedure.

Make a thorough inspection - Thorough inspections should precede the use of any pesticides. The use of a flashlight is an essential part of any inspection. Cockroaches and many other crawling pests spend most of their time in dark protected areas and in small cracks and crevices. The use of a flashlight can help locate these areas. Flushing agents, either dusts or aerosols, are often necessary to drive or flush insects out of their hiding places. Mirrors are sometimes helpful in inspecting hard to reach and out-of-the-way locations.

Pest identification - It is very important to identify the pest infestation before making an application of a pesticide.

Select the proper pesticide - As a general rule, the safest pesticide that will effectively control the pest is the pesticide to use. Other important considerations should include:

- labeling that allows for the intended use
- safety-related problems such as possible stains or persistent odors
- selection of the proper pesticide formulation
- selection of proper equipment

Apply the pesticide properly - The pesticide label will list:

- the sites that may be treated
- how to dilute the chemical
- application methods

There are several different types of application methods:

General application - Application of a pesticide at low pressure to large surface areas, such as floors, sub-flooring, walls or outside areas of a building. In many cases, you will need to determine the square footage of the treatment area in order to determine how much chemical to apply. To determine square footage multiply the length by the width.

Example: You are making a general application for fleas to a room that is 20 feet wide and 20 feet long. The pesticide label directions state to apply 1 gallon of diluted pesticide to 1600 square feet. How much total pesticide would you need to apply?

Answer: Step #1 - First determine the square footage of the room by multiplying 20 feet x 20 feet = 400 square feet

Step #2 - Since we are only treating 400 square feet divide the 400 square feet by the application rate of 1600 square feet. 400 is one fourth of 1600. We apply 1/4 of a gallon, or one quart, to treat the room.

Spot treatment - Applications to limited surfaces where insects are likely to occur. Treated areas cannot be larger than two square feet in size. A spot treatment is not a 2 foot x 2 foot area. A 2 square feet area is 1 foot x 2 feet, or 6 inches by 4 feet, etc.

Crack and crevice – Crack and Crevice applications are applications of a small amount of insecticide into cracks and crevices where insects hide or through which they may enter a building. Such openings occur at expansion joints, between different areas of construction, equipment legs and bases, conduits, motor housings, junction or switchboxes. The crack and crevice treatment may include the use of sprays, dusts, or baits. It does not permit treatment of exposed surfaces.

Crack and crevice treatments are useful for management of crawling pests such as the German cockroach. This treatment results in the insecticide being placed exactly where the insect spends most of its time hiding. Crack and crevice applications using a compressed air sprayer are made using a crack and crevice extension tube. Placement directly into the cracks, as deeply as possible, will allow insecticide to penetrate the area. Avoid any splashing or spraying of the material out of the crack and onto exposed surfaces. This is very important in food-handling establishments and similar areas.

Dusts – Dust can be used alone or to supplement residual sprays and baits. Dusts are applied in a THIN layer to cracks and crevices and wall and cabinet voids using a hand duster. Hand dusters should have a plastic tip at the end. The plastic tip will not conduct electricity if used near electrical outlets or conduits. When used properly, the spout of the hand duster is held in the upper-most (top) position.

Use a power duster or plunger (pump) duster to treat larger voids such as attics or crawl areas. When using a power duster, extreme caution must be used. Never use a dust around sensitive electrical equipment such as computers, phone switching equipment or in aircraft. This could cause failure of the equipment and lead to expensive repairs.

ULV and Fog treatments - Ultra low volume pesticide application is the application of a non-residual pesticide in very small particles. These particles are able to penetrate cracks where insects hide - flushing them out. These insecticides supplement applications of residual insecticides. The term "clean out" is the practice of using ULV, sometimes referred to as fogging, immediately after applying a residual insecticide. This two step approach often gives a higher level of initial control than either the residual or non-residual approach used separately. The use of residual insecticides may be prohibited or inadvisable in some areas. Non-residuals and/or baits may sometimes be the only available treatment option.

Space Fogging - Use space fogging to control/reduce flying insects. The rate of application is very important. The label will tell you the pesticide application rate.

The application for ULV and space fogging treatments requires the determination of the cubic footage. To determine the cubic footage multiply the length by the width by the height. You must also know the output of the application equipment to properly treat the target space.

Example: A room is 25 feet long and 20 feet wide and 10 feet high. The label directions for a pesticide state to apply 1 oz. per 1000 cubic feet. The fogger delivery rate is 1 oz. per minute. How long would you let the fogger run?

Answer: Step #1 - Determine the cubic feet in the room; multiply  $25 \times 20 \times 10 = 5000$  cubic feet

Step #2 - The amount of pesticide is determined by dividing the cubic feet in the room by 1000 (cubic feet per oz. from the application rate). 5000 divided by 1000 is 5. The total chemical needed is 5 ounces.

Step #3 - The fogger delivery rate is 1 oz. per minute. We need to apply 5 ounces of pesticide. Divide 5 oz. by 1 oz./min. and the answer is 5 minutes.

### Termite Control

Termite control specialists must be knowledgeable in several different areas. These include building construction, proper graphing techniques, termite biology and behavior, the proper use of materials, termite treating regulations (minimum requirements), volume calculations, the use and maintenance of equipment and safety. Termite control specialists must use considerable judgment in the performance of every job.

With soil termiticide applications, the major objective is to establish a chemical soil treatment area between the termite nest, usually in the ground, and the wood in a structure. In buildings under construction this is accomplished by keeping wood out of contact with the ground and by pre-treating the soil beneath a slab foundation with insecticide to establish the chemical soil treatment area. Hollow masonry voids and exposed soil around both the interior and exterior perimeter of the building are also treated with the termiticide. In buildings already constructed, the chemical treatment area is created by drilling through masonry and / or concrete substrates to access soil or hollow voids which are then treated with the termiticide.

A complete termite control treatment may involve any or all of the following basic steps. This is determined by the type of construction of the structure.

Mechanical alteration involves modifying the structure to provide a barrier that cannot be penetrated by termites, or to remove conditions that are favorable to termite invasion.

Use of concrete or metal barriers, removal of cellulose (wood) debris, elimination of moisture near or in the structure, establishment of proper ventilation of the infested area, and removal of wood to soil contact are all examples of mechanical treatment.

Soil treating consists of the application of termiticides to the soil under and adjacent to buildings. This creates a continuous chemical soil treatment area.

Foundation treating is the application of termiticide inside a foundation. The objective is to place the termiticide in all cracks at the footing as well as through cracks in the foundation wall that may lead to the ground outside. Treating the inside of hollow concrete block walls or brick veneer walls are examples of foundation treating.

Wood treating is the application of insecticides directly to wood to kill existing termite infestations or to make the wood resistant to termites.

The application of the proper amount of termiticide as well as proper placement is essential to achieving control. The Rules of the Structural Pest Control Act and the termiticide label give directions for minimum treatment standards for control measures. You should be very familiar with the information provided by these documents before you engage in any control procedures.

The Rules specify the following as a comprehensive minimum treatment for termite control:

Remove all cellulose material from underneath the building or areas adjacent. Also remove any other debris that would interfere with inspection or treatment in the area.

Remove all wooden contacts between buildings and outside soil, other than those wooden supports that have been treated with preservatives for ground contact. The minimum clearance between untreated wood and soil must be no less than six (6) inches.

Remove all wooden contacts between buildings and inside soil, other than those wooden supports that have been treated with preservatives for ground contact. In no case shall the minimum clearance between wood and soil in a crawl space be less than eighteen (18) inches.

Remove all visible accessible termite tunnels.

Trench and rod the soil along the outside and inside of foundation walls and around pillars and other supports to a minimum depth of six (6) inches, but not lower than the top of the footing in contact with the soil.

Application of an approved termiticide that is registered by EPA and/or the Georgia Department of Agriculture.

Apply at four (4) gallons per ten (10) linear feet per foot of depth from the soil surface to

the top of footings or a minimum of four feet. Apply to the trenches and backfill or with pressure application through rodding of the intact soil beneath the trench. Soil into which pipes extend from the structure, soil under expansion joints, and soil in any other critical point of potential termite entry must also be treated at the above application rate.

Take steps to prevent back siphoning and the contamination of public water supplies during mixing and filling.

Take precautions to prevent contamination of wells or cisterns, in or close to the structure being treated.

Drill all masonry void areas such as tile, brick, concrete block, chimneys, hollow pillars and other similar structure parts. Apply the termiticide at two (2) gallons per ten (10) linear feet. Drill these void areas no more than twelve (12) inches apart.

Provide vents in crawl spaces as follows:

- one vent every fifteen (15) linear feet, or
- one vent per side of structure when a vapor barrier is installed.

If installing a vent is not possible on one side of the structure you may put the required number of vents on only three (3) sides.

Treat the entire inside perimeter of all earth fills, such as porches, with the termiticide at four (4) gallons per ten (10) linear feet per foot of depth by one of the following methods:

- voiding and applying termiticide
- drilling and rodding from the sides (not to exceed twenty (20) feet)
- drilling from the top at intervals of no more than twelve (12) inches around the perimeter and applying termiticide
- drilling and rodding from inside the foundation

Treat all grade level slabs that touch the structure with the termiticide at four (4) gallons per ten (10) linear feet by drilling and applying along the entire distance where slab joins any part of structure. Drill no more than twelve (12) inches apart and no more than twelve (12) inches from the wall.

Treat concrete slabs at or above grade level with the termiticide at four (4) gallons per ten (10) linear feet per foot of depth by one of the following:

- treat from the inside by drilling through from the top of slab at intervals no more than twelve (12) inches apart
- treat from the outside by drilling and short rodding under the entire perimeter of the slab at intervals no more than twelve (12) inches apart

Treat monolithic slabs by trenching and/or rodding of the soil along the entire perimeter and apply the termiticide at four (4) gallons per ten (10) linear feet. Also apply the termiticide at the same rate to any openings through the slab.

The Rules specify the following as a defined minimum treatment for termite control:

Remove all cellulose material from underneath the building or areas adjacent. Also remove any other debris that would interfere with inspection or treatment in the area.

Remove all wooden contacts between buildings and outside soil, other than those wooden supports that have been treated with preservatives for ground contact. The minimum clearance between untreated wood and soil must be no less than six (6) inches.

Remove all wooden contacts between buildings and inside soil, other than those wooden supports that have been treated with preservatives for ground contact. In no case shall the minimum clearance between wood and soil in a crawl space be less than eighteen (18) inches.

Remove all visible accessible termite tunnels.

Trench and rod the soil along the outside of foundation walls and around pillars and other supports to a minimum depth of six (6) inches, but not lower than the top of the footing in contact with the soil.

Application of an approved termiticide that is registered by EPA and/or the Georgia Department of Agriculture, following all label and labeling directions.

Treatment of all grade level slabs and earth filled porches that are adjacent to the structure with an approved termiticide by drilling and applying along the entire distance where slab joins any part of the structure at intervals of no more than twelve (12) inches and no more than twelve (12) inches from the structure wall.

Take steps to prevent back siphoning and the contamination of public water supplies during mixing and filling.

Take precautions to prevent contamination of wells or cisterns, in or close to the structure being treated.

Provide vents in crawl spaces as follows:

- one vent every fifteen (15) linear feet, or
- one vent per side of structure when a vapor barrier is installed.

If installing a vent is not possible on one side of the structure you may put the required number of vents on only three (3) sides.

New construction treatments or pretreatments are made during construction. They also establish a chemical soil treatment area in the soil. The rates of application for



foundations are the same as in existing construction. Areas to be covered by concrete slabs are treated with termiticide at the minimum rate of one (1) gallon per ten (10) square feet.

If the pretreated slab is not poured on the day of treatment, place a plastic sheet, or similar type material over the treated area.

Termite baits and baiting systems may be used consistent with the product's label. Removal of cellulose material, correction of wood to earth contacts, removal of visible accessible tunnels and ventilation requirements shall remain the same as for termiticide chemical barrier soil applications.

Termite baits must be applied in a manner consistent with all label and labeling directions. Bait systems are particularly appropriate to use where wells, cisterns, or a body of water make a liquid application potentially hazardous. Termite baits use very little active ingredient and can reduce or eliminate a termite colony as the termite workers pass the material to each other through trophallaxis or food sharing.

Termite baits must be monitored consistent with the products label or labeling directions, and when installed as a pre-construction treatment or to satisfy the requirements of a Wood Infestation Inspection Report, must be monitored free of charge for a one year period.

Other approved pesticides intended for termite control other than as a soil barrier may be applied consistent with the product's label. Marker dyes will be used to indicate the areas that have been treated. Removal of cellulose material, correction of wood to earth contacts, removal of visible accessible tunnels and ventilation requirements shall remain the same as for termiticide chemical barrier soil applications.

Borate pre-construction wood treatments must follow all label and labeling directions and adequately cover all available wood surfaces that require treatment. The use of borate pre-construction treatments has greatly increased in the last few years. Borate wood treatments work by making the wood either repellent or toxic to termites. Borates applied on the surface of wood will migrate to the interior over time. At low concentrations, borate products may work like baits by making the wood toxic when termites consume it.

### Wood Boring Beetle Control

The treatment for control or prevention of wood boring beetles, including powder post beetles, wood borers and old house borers, involves the application of a pesticide registered by EPA and/or the Georgia Department of Agriculture. Treatment in crawl spaces must also include installation of a vapor barrier and meeting the proper ventilation requirements.

### Wood Destroying Fungi Control

The minimum treatment for control or prevention of wood destroying fungi shall include the following:

- Install a plastic sheet, or similar type material, to a minimum of 70% of the soil in an enclosed space.
- Install at least one vent in each side of the structure in private residences.
- Install one vent every fifteen (15) linear feet for all other structures.
- If installing the vents is not possible on one side of the structure you may put the required number of vents on three (3) sides.

### Dry Wood Termites

The treatment for control of dry wood termites involves the application of a pesticide registered by EPA and/or the Georgia Department of Agriculture. Other methods may be used if they have been demonstrated to the Structural Pest Control Commission to be effective.

## CHAPTER 8 PROTECTION OF THE ENVIRONMENT

The environment is our surroundings and its many forms of life. Air, water, soil, plants and wildlife are important parts of our environment. Pesticides can damage the environment if misused. It is important that you read and follow label instructions. The label will often have information about specific hazards, such as toxicity to bees or fish. By knowing and following good application practices you can protect both the environment and yourself.

It is important that we all work toward minimizing the risk of contamination to our environment. One of the ways this can be accomplished is by utilizing Integrated Pest Management (IPM). IPM can be considered to be the use of all legally acceptable means to control a pest. It is not, however, the total absence of pesticides. More inspection time, mechanical alterations of the infested area and less use of pesticides, combined with a wider range of the types of pesticides available to the Pest Management Professional gives substance to IPM. The phrase “Less is better” is the cornerstone of IPM.

The fundamentals of pest management involve the following five steps:

- A thorough inspection
- Identification of pest(s)
- Recommendations for treatment, sanitation, as well as mechanical or structural modifications and discussion with the homeowner or business manager
- Treatment
- Evaluation of results through follow-up

- Ongoing problems with sanitation or failure to make agreed upon structural modifications should be documented, in writing, to the property owner. This is of particular importance when dealing with customers that sell or prepare food. Certainly, conditions that endanger the safety of the public in the sale or production of food should be brought to the attention of the proper authorities if they are not corrected by the customer.

The inspection process makes the job of pest control easier by:

- Properly identifying the pest to be controlled
- Finding the source of the problem rather than treating indiscriminately. This allows for the controlled placement of a pesticide to an area where the pest is likely to contact the chemical.
- Utilizing less frequent service; such as quarterly, semi-annually, annually
- Utilizing mechanical controls such as vacuuming, harborage reduction and food reduction.

As a Pest Management Professional you are an important partner in the environment, by responsibly eliminating potentially harmful pests to people and property.

### Environmental Fate

What happens to a pesticide once you have applied it? You need to have a basic understanding so you can better recognize a potential problem. Two processes occur:

- the pesticide's movement;
- the break down of the chemical.

#### Movement in the soil

Adsorption is the binding of a very thin layer of a pesticide to the outside of a soil particle. Soils high in organic matter or clay are more adsorptive than sandy soils. Sometimes the label will allow you to use a higher rate due to the large amount of organic material present. Pesticides bound to soil particles can be moved by wind or water to other locations.

Runoff occurs when water moves over a sloping surface, and carries pesticides either mixed in the water or bound to eroding soil. Pesticides applied to bare sloping ground would more easily move after a heavy rain than if vegetation or plant residues help to retain the soil and the water. Pesticide runoff can damage non-target plants and animals, and contaminate surface or underground water. The use of long-term soil sterilants is undesirable on sloping or bare ground where the herbicide may be carried to desirable vegetation lower down. The correction of grades, installation of ditches, and planting of vegetation can all help to reduce runoff.

Leaching is another way that pesticides move in water. In contrast to runoff when water

moves across the surface of the soil, leaching occurs as water moves down through the soil. Sandy and coarse soils combine poorly with a pesticide and allow water and any dissolved pesticide to leach through the soil. This could contaminate groundwater (underground rock, sand or gravel saturated with water). Since groundwater is a major source of drinking water, this is a major concern. Heavily treated areas, mixing and rinsing sites, waste disposal areas and spills may be sources for contaminating groundwater. High organic matter and clay soils increase adsorption and help to reduce leaching.

Absorption (taken up within the tissues) by plants moves the pesticide into the plant. With some herbicides and insecticides, this is desirable and necessary for them to perform properly. When pesticides are adsorbed to soil particles (such as in high organic matter) less pesticide is available for absorption by the plant. Once absorbed, most pesticides breakdown within the plant.

#### Breakdown of pesticides

Microorganisms such as fungi and bacteria help to breakdown pesticides. Conditions that favor this are warm temperatures, adequate soil moisture, presence of oxygen and organic matter. Microbial breakdown is one of the important ways pesticides are destroyed in the soil. This may sometimes be undesirable if it shortens the effectiveness of a soil pesticide to control a pest.

Chemical break down or degradation is a process not involving living organisms. Adsorption of pesticides to the soil, acidity of the soil, temperature and soil moisture all influence how fast a pesticide will breakdown. Sunlight will breakdown pesticides applied to foliage, soil surfaces or structures. This reduces the time a pesticide will be available to control a pest.

#### Movement in the Air

Volatilization occurs when a liquid pesticide changes into a gas and drifts away from the application site. This is vapor drift. You can sometimes see spray or dust drift during application, but vapor drift is not visible. Some herbicides can volatilize and damage non-target plants. Volatilization increases when it is very hot, the humidity is low, and the spray droplets are small. Sometimes labels will warn you with statements such as:

- At high air or ground surface temperatures, vapors from this product may injure susceptible plants.
- Under very high temperatures, vapors from this product may injure susceptible plants in the immediate vicinity.

Remember, pesticide vapors inside a dwelling can also cause injury to occupants who may be sensitive. Avoid spraying around air conditioning units and forced air heating systems especially where air is being sucked into the system.

Many factors influence pesticide particle drift. Environmental damage similar to

volatilization can occur; the smaller the particle size, the greater the chances of drift. One factor that controls particle size is the size of the nozzle opening. All nozzles produce a range of particle sizes. It is usually best to use a nozzle with a large opening to reduce drift when applying whether inside a building or outside. When using power sprayers outside, do not use any more pressure than is necessary to get the pesticide to the target area; the higher the pressure, the smaller the particle size. Smaller droplets may give better coverage, but at the expense of drift control. Nozzles positioned too high or pointed into the air will dispense spray over a wider area. Since wind speed is usually less close to the ground, direct sprays as close to the target as possible. Consider the proper nozzle, pressure, nozzle spray angle, and height above the target for different type pest control operations.

Air movement will carry pesticides off the target area; the higher the wind speed, the greater the chance of drift. Once pesticides are in the air they cannot be controlled. Winds are usually strongest in mid-afternoon and weakest just before sunrise and after sunset. The application of herbicides has the greatest danger of causing damage to non-target plants by drift.

### Protecting Surface Water

Pesticides can move and contaminate surface water (creeks, ponds, lakes and rivers) by several methods. Runoff, leaching into groundwater that later feeds into surface water by springs, and drift are all methods of contamination. Before spraying near surface water you should check as to what procedures you should use to reduce drift. An untreated buffer zone between treated area and the water may be needed. Some pesticides are very toxic to fish and extra precautions may be needed. The pesticide label will often warn you. A pesticide applied or spilled to surface water may kill fish for long distances as the chemical flows downstream.

### Protecting Groundwater

Groundwater occurs in aquifers which are zones of rock, sand, gravel or limestone and saturated with water. Groundwater has natural outlets in springs, streams and lakes. We can tap the groundwater by drilling a well into the aquifer and pumping out the water. About half the U.S. population and 90% of rural residents get their drinking water from groundwater. Georgia has some of the largest aquifers in the nation. If a water soluble pesticide is applied to a sandy soil over an aquifer that is close to the surface, leaching is likely to occur. This is especially true if there are repeated applications in the same location, dumping of mixes or rinsate on the ground, or spills. It is illegal to dump unneeded pesticide mix or rinsate on the ground.

You should not mix more than you need for a day's operation. If there is still spray left in the tank at the end of the day, it may be used at site listed on the label in compliance with all EPA, state and local policies. Leaving the mix in the tank until the next day is permissible but less desirable since some pesticides once mixed will begin to breakdown. This can also be corrosive to your equipment. Spray rinse water out at a site listed on the

label. Leaving the rinse water in the tank is permissible, but not recommended. Storing unused mix and/or rinse water in separate holding tanks is another option. Some companies will have a cement pad for mixing and rinsing out equipment, drainage to collect waste, and a holding tank. Review your company policy and the procedures you are required to follow.

### Preventing Backsiphoning

Never immerse the water hose into a spray tank. The water pressure can drop to zero if the power goes off on an electric pump at a well. In a city water system the same thing can happen if there is a break in a water main, or if fire hydrants are used. You may have experienced this if you ever turned your water faucet on and no water came out. You probably heard air being sucked into the open faucet. This is negative pressure. It's like sucking up a soda with a straw. A hose immersed in a spray tank draws the pesticide from the tank and directly into the well and groundwater, or city water system. To prevent this from happening, always use an anti-backflow device. Also keep the hose end above the tank opening.

If your source of water is a well, it is safer to mix and rinse at least 100 feet from the well. Accidental spillage could contaminate the groundwater. Many wells are not tightly sealed near the soil surface. Pesticides leaching or carried by runoff into the well itself could quickly contaminate the groundwater.

### Protecting Pollinators

Bees and other insects pollinate many fruits, vegetables and field crops. Pesticides vary in their toxicity to pollinators. The label will usually warn you of this hazard. Dusts, because they are picked up by bees like pollen, are more hazardous than sprays. Emulsifiable concentrates are usually less toxic than wettable powders. Spraying in the late afternoon or evening is less hazardous to pollinators than earlier in the day. If there are bee hives adjacent to an area you are treating, warn the owner before beginning. Then he can protect them if needed.

### Spills

All service vehicles are required to carry enough absorbent material to control the largest spill that can occur on that vehicle. Keep people and pets away from spilled pesticides. Confine the spill by soaking it up with an absorbent material. If in a building and you don't have an absorbent material at hand, a rag, baking soda or flour can be used to contain small spills. Sweep the absorbed material up into a double plastic bag. In the home, baking soda over a spill on an absorbent surface is useful to soak up remaining traces of chemical. This will help deodorize if this is a problem. Leave the baking soda in place for at least 24 hours before removal.

In a large spill, such as overturning a tank in an auto accident, use the absorbent material to contain the spill if possible. You should also contact you supervisor as soon as

possible. Your major responsibility in this event is to keep the public away from the spill until assistance arrives.

### Disposal of Containers

- Never leave pesticides or pesticide containers at the application site. Always follow the products directions for container disposal. The container disposal directions will vary from product to product. Many liquid pesticide containers can be triple-rinsed as follows:
- Empty the container into the spray tank. Allow it to drain for 30 seconds
- Fill container 1/5 to 1/4 full of water.
- Replace closure and rotate container so the rinse reaches all surfaces
- Drain the rinse into the spray tank for at least 30 seconds Repeat rinsing two more times
- Puncture and if possible crush the container. It is now no longer considered a toxic waste and may be disposed of at the sanitary landfill

Many containers now say "triple-rinse or equivalent." Research has shown that pressure rinsing is equivalent. Pressure rinsing consists of a special nozzle that screws into the end of a hose. This nozzle has a sharp point that is rammed into the bottom of the pesticide container. The container is placed so it will drain into the spray tank. The water is turned on at the nozzle, and it jets water out in four directions near the point. The nozzle is rotated for 60 seconds so all sides of the container are washed. This method is to be quicker, more effective, and already puts a hole in it for disposal.

Empty boxes or bags from dry pesticides can be disposed of at the sanitary landfill. Open burning is not permitted.

### Disposal of Excess Pesticide

Every effort should be made to use up all pesticides according to label directions. Occasionally, some pesticide will be left over and it becomes necessary to dispose of it. The two most common ways of disposal are:

- spray around the exterior of the last account of the day to use up the pesticide
- add the left over pesticide to a termite spray tank

Remember that your work will be observed by your customer as well as the public. Pesticide safety and environmental hazards have increasingly become public concerns. Anyone observing your work can complain if they believe you are being careless. You should always be a professional in your work area and never hesitate to call or ask your supervisor if you are unsure of how to handle a situation. No one ever becomes so wise and experienced that they should hesitate to ask for advice. This will help you operate more safely and efficiently in serving the public.

## CHAPTER 9 SAFETY

As a professional pest control operator you have the legal and professional requirement to follow all pesticide label directions. This includes limiting pesticide exposure to yourself, your customers, their pets, and property.

### Pesticide Exposure

Pesticides are all toxic at some level. A common measurement of toxicity is called the LD50. It is the dose needed to kill 50% of the animals in a test population (usually rats, mice, or rabbits). It is measured in milligrams of the pesticide per kilogram of body weight (mg/kg); the lower the LD50 the more toxic the pesticide. Thus, a pesticide with an LD50 of 10 is more toxic than a pesticide with an LD50 of 100. The LD50 is a reference figure to compare the toxicities of different pesticides.

There are two types of toxic action for most pesticides. They are acute toxicity and chronic toxicity.

- Acute toxicity is a rapid response, often within minutes or hours, to a single exposure.
- Chronic toxicity is the effect of repeated sub-lethal exposures over time.

The hazard of using a pesticide is dependent on the exposure and the toxicity. For example, a pesticide is more hazardous to use in the concentrated or undiluted form than its diluted form. There is, however, a greater chance of exposure to the pesticides active ingredient when the material is concentrated. Thus, it is more hazardous.

Pesticide exposure can occur in three ways. They are skin exposure, inhalation (by breathing it), and ingestion (by the mouth).

### Skin Exposure

The skin surface is the most likely path of pesticide exposure. Some pesticides and solvents can easily penetrate unbroken skin. All pesticides can readily penetrate cuts and abrasions. Some pesticides can cause a corrosive effect on the skin. Some body regions will absorb pesticides more quickly than other areas. The eyes, genital areas, and underarms are some of these areas. Always wash your hands before rubbing the eyes or using the lavatory after using a pesticide.

### Inhalation

Inhaling pesticides is extremely dangerous. The lining of the lungs is very thin and permits rapid absorption of pesticides into the blood. Dusts, mists, aerosols, and fumigants offer the most hazard by inhalation.

The proper use of a respirator or gas mask can reduce exposure by inhalation. It is very important to assure a proper fit when using this equipment. The respirator or gas mask should fit tightly against the face. Air should come only through the device not from around the edges. Beards can interfere with the mask's fit.



If you inhale a pesticide you should

- leave treated area immediately
- get fresh air and take deep breaths

#### Ingestion

Ingested pesticides are slowly absorbed. Normally, the digestive tract will only absorb a portion of the ingested material.

Pesticides enter the mouth by two paths either by direct ingestion or by residues on the hands that can be ingested by eating or smoking. Always wash hands before eating or smoking and store pesticides away from food products.

If you swallow a pesticide you should rinse mouth thoroughly and drink large amounts of water

Pesticides that enter the body are transported by the blood throughout the body. They reach the site of action that may be the nervous system, kidneys, liver, or lungs. Some are also stored in fat deposits or other tissues for extended times before their toxic action occurs.

The above first aid recommendations are guidelines only. You should always read the label and be familiar with the first aid procedures on the label before using a pesticide. It is also recommended that you consult with a medical professional or poison control center in case of exposure to pesticides.

Proper use of protective equipment including proper laundering can reduce exposure to pesticides. You should read the label of the pesticide you are using to see what protective equipment is needed. Some common protective equipment includes:

- Chemically resistant gloves
- Chemically resistant apron
- Goggles
- Face shield
- Respirator with proper cartridges
- Long sleeve coveralls
- Chemically resistant footwear
- Ear protection
- Hard hat

Proper maintenance of protective equipment and clothing is an important aspect of proper personal protection. Some common storage, cleaning and maintenance practices include:

- Properly wash goggles, gloves, respirator (remove cartridges), face-shield, boots, hat, and ear protection after use to eliminate any pesticide residues.
- Thoroughly launder clothing such as coveralls, shirts, socks, pants, and other articles before reusing. Avoid contaminating other clothing articles prior to or

- during laundering.
- Store extra cartridges for the respirator in a sealed container.
- Be sure that the respirator cartridges are the proper type for the chemical you are applying. Be sure that you change cartridges when necessary.

If a pesticide is spilled on the body you should:

- remove contaminated clothing
- wash affected area with soap and water
- wash clothing before reuse

### Symptoms of Pesticide Poisoning

The symptoms of pesticide poisoning normally occur within a few hours of exposure. Symptoms that occur more than 12 hours after exposure are probably the result of something other than a pesticide. Any part of the body may show an injury after exposure to a toxic material. Pesticide effects will usually include one or more of the following:

- Dermatological (Skin) - produces rashes, redness, itching, and swelling
- Neurological (Nervous system) - tremors, headache, nausea, depression, disturbed sleep patterns, altered behavior
- Reproductive (Testis, ovary, fetus) - infertility, birth defects
- Carcinogenic (Any organ) - presence of cancers, tumors

### Organophosphate Pesticide Poisoning

- Mild Poisoning
  - Fatigue
  - Headache
  - Dizziness
  - Blurred vision
  - Excessive sweating
  - Stomach cramps
  - Diarrhea
- Moderate Poisoning
  - Weak feeling
  - Chest tightness
  - Muscle twitches
  - Eye pupil constriction
- Severe Poisoning
  - Unconsciousness
  - Pinpointing of eye pupils
  - Increased muscle contractions
  - Excess salivation
  - Breathing difficulties

- Death

### Carbamate Pesticide Poisoning

Carbamate pesticides produce the same poisoning symptoms as organophosphates. However, the effects are usually less severe, take longer to develop, and are easier to treat.

### Synthetic Pyrethroid Poisoning

- Watery eyes
- Runny nose
- Respiratory discomfort
- Irritation of tender skin (face, groin)
- General allergic reaction

### Botanical Pesticides Poisoning (Pyrethrins)

Botanical pesticides are low in acute toxicity to people. Respiratory discomfort and eye and skin irritation may be experienced.

### Chlorinated Hydrocarbon Poisoning

- Headache
- Nausea
- Vomiting
- Dizziness
- Irritability
- General discomfort
- Coma

### Anticoagulant Poisoning

- Reduced blood clotting
- Internal bleeding

### Poison Control Centers

Poison control centers exist in all states. They provide information to the public and the medical profession on the prevention and treatment of accidental poisoning. This service is available 24 hours a day. The nationwide phone number for poison control centers number is 800-222-1222:

You should keep this number in your wallet, in your service kit, and inside your service vehicle.

Most pesticide labels also contain a 24 hour a day hotline number that can provide information in case of accidental poisonings. This number is usually a toll free number.

Pesticide manufacturers have also set up a 24 hour emergency number to provide information on pesticides. This number is called CHEMTREC. The number is 1-(800) 424-9300. The web address

for CHEMTREK is [www.chemtrek.org](http://www.chemtrek.org).

The National Pesticide Information Center (NPIC) also provides information on pesticide poisoning. The number is 1-(800) 858-7378. The web address for NPIC is [www.npic@ace.orst.edu](mailto:www.npic@ace.orst.edu).